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Evaluation of Short-Run Market Performance and its Determinants Using Marginal Analysis and Binary Models: Evidence from Australian Initial Public Offerings

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ABSTRACT

To determine whether Australian initial public offerings (IPOs) underprice in the short run, and to identify their determinants, this study investigated the short-run market performance of 254 IPOs listed between 2006 and 2011 by industry and year (listing and issue). To measure their short-run performance, the first listing day returns were divided into the primary market, the secondary market, and the total market. The investigation was then extended to a post-day listing analysis that included returns of up to nine trading days. To identify the determinants of short-run market performance, this study estimated binary regression models with offer, firm and market characteristics. Marginal probability analysis was also carried out to estimate the associated probability of each determinant that indicated a directional change in market performance. The marginal probability analysis is a novel contribution to the Australian IPO literature. The study found that overall, the Australian IPOs underpriced by 25.47% and 23.11% based on the market-adjusted average abnormal return (AAR) in the primary and total markets, respectively. However, the secondary market analysis indicated that the Australian IPOs overpriced by 1.55% based on the AAR. The examination of post-listing returns showed that the Australian IPOs underpriced based on the average cumulative abnormal return (CAR), which signals that investors' wealth can be diluted in the long run. The overall results varied by industry and year. The IPO period (IPOP), time to listing (TOTP), listing delays (LISD), total net proceeds ratio (TNPR) and market volatility (MV) were the main determinants for the observed short-run performance. Marginal probability analysis also indicated that the MV and TNPR had a significant effect on the directional changes of the short-run performance. The findings support Rock's hypothesis and the uncertainty hypothesis.

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1. Introduction

The evaluation of the short-run market performance of initial public offers (IPOs)[1] has attracted much attention in prior studies due to the wealth of initial investors in different countries. Underpricing[2] of IPOs is widely accepted as a short-run market phenomenon, and is considered universal. This phenomenon was first documented in the finance literature by Stoll and Curley (1970), Logue (1973) and Ibbotson (1975). To test the underpricing phenomenon, most researchers used the first listing day average return, defined as the closing price performance that covers the period from the issuing date to the end of the first trading day[3] (Chan, Wang & Wei 2004; Chang et al. 2008; Dimovski & Brooks 2005; Finn & Higham 1988; Ibbotson, Sindelar & Ritter 1994; Lee, Taylor & Walter 1996; Loughran & Schultz 2006; Moshirian, Ng & Wu 2010; Omran 2005; Ritter 1987).

However, analysing the short-run market performance based on the first-day return may not provide sufficient information to investors. The reasons for this are that (1) the investors do not know much about newly listed companies; (2) the motive of speculative investors on the first day is to earn higher profit; (3) the market needs to have a reasonable time period to settle down in the short run; (4) the closing price performance (first-day return) does not provide a clear answer about who is the beneficiary of the short-run underpricing; and (5) there is price variation between the beginning and end of the first trading day.

To overcome reasons (1), (2) and (3) associated with first-day returns, some researchers have suggested extending the evaluation period from the first-day return to the post-listing day return. Ritter (1991) also documented that short-run market performance can be evaluated using an initial period that includes both first-day and post-day returns. Thus, both the first-day return and the post-day listing return have been used to measure short-run market performance (Aktas, Karan & Aydogan 2003; Finn & Higham 1988; Kenourgios, Papathanasiou & Melas 2007; Sohail, Raheman & Durrani 2010). Other researchers have argued that short-run market performance should be evaluated using the

[1]An IPO refers to an initial public offering that is the first sale of a corporation's equity shares to investors on a public stock exchange, and is known as unseasoned equity.

[2]Dimovski and Brooks (2004) defined underpricing as the issue price of a newly listed company's shares being below the price at which the shares subsequently trade. Underpricing is considered as transferring wealth from the issuing firm to initial IPO investors.

[3]The positive (negative) average return of the first listing day is known as underpricing (overpricing).

opening price performance, which splits the first-day return into two parts; the first-day primary market return (PRIM) and the secondary market return (SECON), and thus overcomes reasons (4) and (5). The PRIM covers the period from the issuing date to the beginning of the listing date, and the SECON covers from the beginning to the end of the listing date. Accordingly, Aggarwal and Conroy (2000), Barry and Jennings (1993), Bradley et al. (2009), Chang et al. (2008), Edwards and Hanley (2010) and Schultz and Zaman (1994) used the opening price performance, which includes primary (offer-to-open) and secondary (open-to-close) market returns (MRs). However, a review of past Australian IPO studies has indicated that short-run market performances have not yet been evaluated by the PRIM, SECON, total MR and the post-day listing returns. This type of IPO short-run market performance analysis could provide information that is valuable for investors.

Having indentified the importance of analysing the short-run market performance (short-run underpricing) using the PRIM, SECON, total MR and post-day returns, it is necessary to determine the resons for short-run market performance. Ritter (1998) and Ritter and Welch's (2002) studies provide a list of asymmetric information theories, such as the winner's curse, signalling, uncertainty and agency cost, to explain the reasons (determinants) for the short-run performance. These theories have been tested by many IPO researchers, by developing multiple regression models with different determinants. However, while the multiple regression model identifies determinants, it does not provide the associated marginal probabilities (risks) of determinants, which shows the changes in short-run market performance. These marginal probabilities are more important for IPO investors due to the change in economic and financial factors that cause higher uncertainity in the IPO market.Therefore, some researchers have used binary regression models to estimate the associated probability of occurrence compared to the multiple regression model, thus providing more information to IPO investors to assist their investment decisions. The marginal probability shows the directional changes in the short-run market performance, and is used to determine the most important determinants that cause changes in short-run performance. A review undertaken on previous Australian IPO studies showed that the determinants of short-run market performance have not been analysed with the aid of a combination of binary regression and marginal probabilty analysis. This anaysis is a novel contribution to the Australian IPO literature.

Therefore, this research paper seeks to examine (1) whether Australian IPOs underprice in the short-run using the PRIM, SECON, total MR and the post-day return, and (2) what are the reasons for short-run underpricing, with the aid of binary (logit and probit) regression models and a marginal probability analysis. The post-day returns are calculated up to nine trading days after the first trading day. The market-adjusted average abnormal return (AAR) is used to measure the short-run performance in the first-day primary market, secondary market and total market and the average cumulative abnormal return (CAR) used in the post-listing period.

The remainder of this article is organised as follows. Section 2 reviews the evidence on short-run market performance. Section 3 covers the data and methodology. Section 4 discusses the results and analyses and Section 5 concludes.

2. Evidence on Short-Run Market Performance

The Australian IPO market has been widely examined by many researchers. Finn and Higham (1988) reported that Australian industrial and commercial IPOs are underpriced by 29.2%. Lee, Taylor and Walter (1996), How, Izan and Monroe (1995) and Dimovski, Philavanh and Brooks (2011) also reported that industrial sector IPOs are underpriced in the short-run market by 11.86%, 19.74% and 29.6%, respectively. Dimovski and Brooks (2008) and How (2000) documented that mining IPOs are underpriced by 13.3% and 107.18%, respectively. Nguyen, Dimovski and Brooks (2010) found that resource IPOs are underpriced by 16.13%. Dimovski and Brooks (2004, 2005) also found that Australian mining and energy IPOs and industrial and resource IPOs are underpriced by 17.93% and 25.6% on the first-day return, respectively. Da Silva Rosa, Velayuthen and Walter (2003) reported that venture capital-backed and non-venture capital-backed IPOs are underpriced by 25.47%, whereas Gong and Shekhar (2001) found privatised IPOs are underpriced by 11.96%. Bird and Yeung (2010) and Bayley, Lee and Walter (2006) also found that Australian IPOs are underpriced by 37.35% and 26.72%, respectively.

The United States (US) IPO market has been researched extensively over the last two decades. Johnston and Madura (2002) have studied internet and non-internet IPOs in the period between 1996 and 2000, and their study showed that the initial returns were more favourable for internet than non-internet IPOs. Further, their study showed that the level of underpricing of internet firms did not become statistically significant due to the demise of the internet sector. They investigated a sample of 366 IPOs, and found the average initial

return was 78.5%. The US IPO market was also analysed by Loughran and Schultz (2006) and Ritter and Welch (2002), who reported that the average initial day returns were 18.1% and 18.8%, respectively. Further, Ibbotson (1975), Ritter (1987), and Ibbotson, Sindelar and Ritter (1994) reported that initial day returns were between 11.4 % and 47.8%.

Moshirian, Ng and Wu (2010) examined the price performance of emerging and developed Asian markets and found that China, Korea, Malaysia, Hong Kong, Japan and Singapore IPOs were underpriced on their first-day returns by 202.93%, 70.3%, 61.81%, 21.43%, 34.04% and 33.10%, respectively. The study of Sohail, Raheman and Durrani (2010) indicated that Pakistani IPOs were underpriced under the general state of economy by 42.17%, 40.99%, 37.35%, 38.17% and 39.38% on the close of first, fifth, tenth, 15th and 20th days, respectively. Chan, Wang and Wei (2004) also analysed the Chinese IPO market and found that the average level of underpricing in A-shares and B-shares was 178% and 11.6%, respectively. Further, Banerjee, Hansen and Hrnjic (2009) found that on average, investors in Singaporean IPOs out-perform (underpricing) in the short-run.

The evidence from the international literature on short-run market performance shows that the level of underpricing and its determinants may vary according to the sample period, state of the economy, nature of the market and industry, among other factors. Therefore, there is a need to measure the level of underpricing and establish its determinants by the current market, as a result of the changing economic conditions.

3. Data and Methodology

3.1 Data and Sample Selection

In order to analyse the short-run market performance of Australian IPOs, all IPO data was collected from the Connect4 database (www.connect4.com.au), which specialises in IPOs. This study examines listed fixed price offering equity[4] IPOs on the Australian Securities Exchange (ASX) from January 2006 to January 2011. A sample was selected based on the stratified random sampling method, with industry or sector as a main criterion. To analyse IPOs by industry, all the listed IPOs during this period were subdivided into seven sectors using the industry criterion. Financial sector IPOs and property and equity trusts or close-end fund IPOs were excluded from the sample, following the analyses of other researchers

[4]An IPO in which the price is set and quoted in the prospectus and remains unchanged until completion of the offer.

(Dimovski & Brooks 2004; Ahmad-Zaluki, Campbell & Goodacre, 2007)[5]. Mergers, takeovers and restructuring schemes were also eliminated from the sample because they undeservedly impact on company IPO performances. Due to the large number of listed IPOs in the resource sector, the sample selected from this industry represents only 33% of the total listed IPOs, while other sectors represent 100%. Based on the availability of data, we selected 254 IPOs for the final sample, which represents 47% of the total number of IPOs listed from January 2006 to January 2011.

Table 1 shows the number of sample companies, offer proceeds (issue price per share*, number of issued shares) and money left on the table (the first-day returns in terms of AUD) classified by industry, listed year and issue year. Comparison of the number of IPOs with offer proceeds by industries showed that the resource sector provided 56% of the sample's IPO companies, but it generated only 12% of the total sample offer proceeds. The industrial sector represented 18% of the sample IPO companies, but contributed 65% of the total sample proceeds, which was the highest offer proceeds of all the sectors examined. The industrial sector had the highest value for money left on the table compared to all other sectors, which shows that on average, the market price of the industrial sector is higher than other sectors. The utility sector gave a negative value for money left on the table, which showed that the wealth of the investors in this sector was diluted compared to all other sectors. When examining the listing years, money left on the table had negative values in 2010 and 2011 as a result of higher issue prices compare to the first listing day market price. Issue years 2008 and 2010 had negative values for money left on the table due to higher issue prices.

[5]These researchers mentioned that IPOs in the finance, trust, and closed-ends funds sectors are not comparable with non-financial companies. These companies' annual reports are normally prepared according to different statutory requirements.

Table 1
Number of sample companies, offer proceeds and money left on the table by industry, listing year and issue year

Sample Classification	Number of IPOs	%	Offer Proceeds[1] (AUD 000)	%	Money Left on the Table[2] (AUD 000)
By Industry					
Resources (energy, metals & mining)	143	56	1,279,743	12	113,727
Chemicals/Materials	4	2	953,400	9	113,042
Industrials	46	18	6,717,995	65	190,481
Consumer discretionary/Staples	31	12	588,975	6	72,296
Information technology	20	8	645,582	6	96,831
Telecommunications	4	2	22,573	0	2,749
Utilities	6	2	79,750	1	-7,020
Total	**254**		**10,288,018**		**582,106**
By Listing Year					
2006	68	27	2,856,066	28	216,233
2007	91	36	1,607,983	16	244,248
2008	29	11	361,219	4	166,584
2009	17	7	368,500	4	45,445
2010	41	16	5,045,650	49	-85,511
2011	8	3	48,600	0	-4,893
Total	**254**		**10,288,018**		**582,106**
By Issue Year					
2005	9	4%	53,296	1	19,299
2006	69	27%	2,887,770	28	191,578
2007	96	38	1,666,183	16	421,421
2008	19	7	272,019	3	-10,911
2009	16	6	332,000	3	52,203
2010	45	18	5,076,750	49	-91,484
Total	**254**		**10,288,018**		**582,106**

Note:
[1]Issue price per share x number of issued shares
[2]Money left on the table indicates the first-day returns in terms of AUD earned by initial investors. This is calculated as (market price per share - issue price per share) x number of issued shares

3.2 Methodology

Having selected the sample of IPO companies by industries, listing years and issue years, the market prices of the sample companies were selected from the Morningstar database (www.morningstar.com.au).To measure the market performance of IPOs, this study selected the first-day adjusted[6] opening and closing market prices, and the post-listing day adjusted prices.

In order to calculate abnormal returns, the first listing day primary, secondary market and total market raw returns were calculated using the following equations:

[6]Adjusted prices are prices adjusted for any dilution factors, such as bonus issues, rights issues, options etc.

$$PR_i = \frac{P_{i,b} - P_{i,o}}{P_{i,o}} \quad (1)$$

Where:

$\boldsymbol{PR_i}$ = the first listing day primary market raw return for security i measures between the issue price

and the beginning of the first listing day price

$\boldsymbol{P_{i,b}}$ = the beginning price of security i at the first listing date

$\boldsymbol{P_{i,o}}$ = the issue (offer) price of security i at the time of issue

$$SR_i = \frac{P_{i,c} - P_{i,b}}{P_{i,b}} \quad (2)$$

Where:

$\boldsymbol{SR_i}$ = the first listing day secondary market raw return for security i measures between the beginning

price and the closing price of the first listing day

$\boldsymbol{P_{i,c}}$ = the closing price of security i at the first listing day

$\boldsymbol{P_{i,b}}$ = the beginning price of security i at the first listing date

$$TR_i = \frac{P_{i,c} - P_{i,o}}{P_{i,o}} = [(1 + PR_i) \times (1 + SR_i)] - 1 \quad (3)$$

Where:

$\boldsymbol{TR_i}$ = the first listing day total market raw return for security i measures between the issue price and

closing of the first listing day price

$\boldsymbol{P_{i,c}}$ = the closing price of security i at the first listing day

$\boldsymbol{P_{i,o}}$ = the issue (offer) price of security i at the time of issue

$\boldsymbol{PR_i}$ = the first listing day primary market raw return for security i

$\boldsymbol{SR_i}$ = the first listing day secondary market raw return for security i

From the above raw returns (PR_i, SR_i and TR_i), the market-adjusted abnormal/excess returns were calculated to measure the short-run market performance in the primary, secondary and total markets. The abnormal/excess return is considered as a superior

performance measure relative to the raw return because it adjusts the MR of each IPO. The MR can be calculated by using ASX indices such as the ASX 200, ASX 300 etc. However, this study used the All Ordinary Index (AOX) as a market benchmark to measure the abnormal/excess MRs because this price index covers 95% of the listed company prices in the ASX (http://en.wikipedia.org/wiki/All_Ordinaries). The AOX data were obtained from the DataStream database. The following equations are used to calculate the market-adjusted abnormal (AR) return and the AAR.

$$AR_{it} = R_{it-} R_{mt} \quad (4)$$

Where:

$\boldsymbol{AR_{it}}$ = the market-adjusted abnormal rate of return for company (*i*) in period (*t*)

$\boldsymbol{R_{it}}$ = the rate of return for company (*i*) in period (*t*) from PR_i, SR_i, and TR_i

$\boldsymbol{R_{mt}}$ = the rate of return on the benchmark (market) during the corresponding time period (*t*)

$$AAR_t = \frac{1}{n}\sum_{i=1}^{n} AR_{i,t} \quad (5)$$

Where:

$\boldsymbol{AAR_t}$ = the market-adjusted AAR, n = the number of IPO companies in period (*t*)

To determine whether the average raw and abnormal returns are statistically significant, this study used the following t-statistics (Ritter 1991; Brown & Warner 1985; Omran 2005).

$$t(AAR) = AAR_t * \frac{\sqrt{n_t}}{\sigma_t} \quad (6)$$

Where:

$\boldsymbol{AAR_t}$ = the market-adjusted AAR for day *t*

$\boldsymbol{\sigma_t}$ = the cross-sectional standard deviation of the return for day *t*

From the above market-adjusted AAR, this study calculates the CAR following the method used in previous studies (Ritter 1991; Aktas, Karan & Aydogan 2003). This

measure is useful to analyse the short-run performance of IPOs after listing. Therefore, the CAR was calculated for nine post-listing days using the following equation[7]:

$$CAR_{q,s} = \sum_{t=q}^{s} AAR_t \quad (7)$$

Where,

$\boldsymbol{CAR_{q,s}}$ = the market-adjusted post-day listing return (performance) from event day q to event day s

The t-statistic for the cumulative market-adjusted AAR is computed as follows (Aktas, Karan & Aydogan 2003):

$$t(CAR) = \frac{CAR_t}{\sigma(CAR)_t} \quad (8)$$

Where:

$\boldsymbol{\sigma(CAR)_t} = \sigma(AR)_t * (t+1)^{1/2}$

$\boldsymbol{\sigma(AR)_t}$ = the variance of market-adjusted abnormal return over *t* days

The short-run market performance models were estimated using logit and probit binary regression statistical models. The dependent variables in the binary models were defined as '1' and '0', where underpricing[8] was considered as '1' and overpricing as '0'. The explanatory variables in all these models are given in Table 2. In addition to these explanatory variables, the industry, represented by dummy variables, was also tested in these models with a view to capture the industry effect. The binary regression models were estimated with the Eviews (Version 7) statistical package. The determinants of short-run underpricing (short-run market performance) can be identified with aid of estimated binary regression models.

[7]The CAR is calculated after considering the first listing day total market return.

[8]Underpricing (overpricing) is defined as positive (negative) market-adjusted abnormal returns in the short-run IPO market.

Table 2
Issue, firm and market characteristics

Explanatory Variable	Variable in the Model	Variable Measure	Expected Sign	Variable Proxy for Theory
Issue Characteristics				
IPO period (time given to invest)	IPOP	Period from the opening to closing day of the offer, measured in calendar days	Negative	Rock hypothesis
Oversubscription ratio	OVER	Number of demand shares over the number of shares offered	Positive	Signalling hypothesis/Rock hypothesis
Issue price	ln (PRICE)	Offer price of the issue	Negative	Signalling hypothesis/Uncertainty hypothesis
Offer size	ln (OSIZE)	The number of offered shares x issue price	Negative	Uncertainty hypothesis
Listing delay	LISD	Time period between the proposed listing date and the actual listing date, measured in business days	Positive/ Negative	Uncertainty hypothesis/Rock hypothesis
Total listing period (time to listing)	TOTP	Time period between the issued date and the listed date, measured in business days	Negative	Rock hypothesis
Issue cost ratio	ICOR	Total issue cost relative to the total offer proceeds. The total issue cost includes the ASIC fee, ASX fee, broker commission, managers' fees, annual report fee, legal costs, industry report fee, printing fee and other costs	Positive	Uncertainty hypothesis
Total net proceeds ratio	TNPR	1 minus ICR	Negative	Uncertainty hypothesis
Underwriter availability	UWRA	A dummy variable that defines 1 for 'underwritten IPOs' and 0 for 'non-underwritten IPOs'	Positive	Signalling hypothesis
Attached share option availability	ATOA	Some issued IPOs are attached with a free share option and some are not. This is a dummy variable that defines 1 for 'yes' and 0 for 'no'	Negative	Agency cost hypothesis
Oversubscription option availability	OVSO	Some IPOs accept oversubscription and some do not. This is a dummy variable that defines 1 for 'yes' and 0 for 'no'	Positive	Signalling hypothesis/Rock hypothesis
Recover of working capital	WICP	Some issued IPOs recover their working capital needs from the initial issued capital and some do not. This is a dummy variable that defines 1 for 'Yes' and 0 for 'no'	Positive	Uncertainty hypothesis
Firm Characteristics				
Book value per share	ln (BOOKV)	Total equity capital divided by the number of equity shares	Positive	Signalling hypothesis
Original ownership	OWSH	Percentage of shares retained by original owners	Positive/ Negative	Signalling/Agency cost/Ownership dispersion hypothesis
Firm age	ln (1+FAGE)	Number of years between the year of creation and listing	Negative	Uncertainty hypothesis
Firm size	ln (FSIZE)	Total assets at the end of the year preceding the IPO of an issuing firm	Negative	Uncertainty hypothesis
Market Characteristics				
Market volatility	MV	Standard deviation of daily MRs over the two months before the closing date of the offer	Positive	Uncertainty hypothesis
Average market return	RETU	Square value of the average daily MRs over the two months before the closing date of the offer	Positive	Uncertainty hypothesis
Market sentiment	MS	Changes in the AOX from the date of the issue to the AOX to the day of the listing	Positive	Uncertainty/Signalling hypothesis
Hot issue market	HC	Hot issue market is identified as the issue year using IPO volume and first-day return where the number of IPOs and average first-day returns (in the sample) are greater than the sample's average. This is a dummy variable that defines 1 for 'hot issue market' and 0 for 'otherwise'	Positive	Hot issue market hypothesis

Logistic model

$$ln\left[\frac{P_i}{1-P_i}\right] = \alpha + \beta_1 IPOP_i + \beta_2 OVER_i + \beta_3 lnPRICE_i + \beta_4 lnOSIZE_i + \beta_5 LISD_i + \beta_6 TOTP_i + \beta_7 ICOR_i + \beta_8 TNPR_i + \beta_9 UWRA_i + \beta_{10} ATOA_i + \beta_{11} OVSO_i + \beta_{12} WICP_i + \beta_{13} lnBOOKV_i + \beta_{14} OWSH_i + \beta_{15} ln(1 + FAGE_i) + \beta_{16} lnFSIZE_i + + \beta_{17} MV_i + \beta_{18} RETU_i + \beta_{19} MS_i + \beta_{20} HM_i + \sum_{i=1}^{6} \beta_i D_i + \varepsilon_i \quad (9)$$

Probit model

$$P_i = \alpha + \beta_1 IPOP_i + \beta_2 OVER_i + \beta_3 lnPRICE_i + \beta_4 lnOSIZE_i + \beta_5 LISD_i + \beta_6 TOTP_i + \beta_7 ICOR_i + \beta_8 TNPR_i + \beta_9 UWRA_i + \beta_{10} ATOA_i + \beta_{11} OVSO_i + \beta_{12} WICP_i + \beta_{13} lnBOOKV_i + \beta_{14} OWSH_i + \beta_{15} ln(1 + FAGE_i) + \beta_{16} lnFSIZE_i + + \beta_{17} MV_i + \beta_{18} RETU_i + \beta_{19} MS_i + \beta_{20} HM_i + \sum_{i=1}^{6} \beta_i D_i + \varepsilon_i \quad (10)$$

Where: $\boldsymbol{P_i}$ is the probability that underpricing (1) occurs in the short-run market; $\boldsymbol{1 - P_i}$ is the probability that underpricing does not occur or that overpricing (0) occurs in the short-run market; $\boldsymbol{ln\left[\frac{P_i}{1-P_i}\right]}$ is the natural log value of the odds ratios (in other words the probability of occurring) for the event of underpricing (1) occurrence; $\boldsymbol{IPOP_i}$ is the period from the opening to closing days of the offering firm *i*; $\boldsymbol{OVER_i}$ is the oversubscription ratio of firm *i*; $\boldsymbol{lnPRICE_i}$ is the natural log value of the offer price of firm *i*; $\boldsymbol{lnOSIZE_i}$ is the natural log value of the offer size of firm *i*; $\boldsymbol{LISD_i}$ is the period of LISD of firm *i*; $\boldsymbol{TOTP_i}$ is the total time period for the listing of firm *i*; $\boldsymbol{ICOR_i}$ is the issue cost ratio of firm *i*; $\boldsymbol{TNPR_i}$ is the total net proceeds ratio of firm *i*; $\boldsymbol{UWRA_i}$ is the underwriter availability of the offer in firm *i*; $\boldsymbol{ATOA_i}$ is the attached share options available with the offer of firm *i*; $\boldsymbol{OVSO_i}$ is the oversubscription option of firm *i*; $\boldsymbol{WICP_i}$ is the working capital recovery from the offer proceeds of firm *i*; $\boldsymbol{lnBOOKV_i}$ is the natural log value of the book value per share of the firm *i*; $\boldsymbol{OWSH_i}$ is the original ownership of firm *i*; $\boldsymbol{ln(1 + FAGE_i)}$ is the natural log value of the age of issuing firm *i*; $\boldsymbol{lnFSIZE_i}$ is the natural log value of the size of issuing firm *i*; $\boldsymbol{MV}$ is the market volatility; $\boldsymbol{RETU}$ is the average MR before the closing date of the offer; and $\boldsymbol{MS}$ is the market sentiment; $\boldsymbol{HM}$ is the hot issue market dummy; $\boldsymbol{D_i}$ = industry dummy variables such as $\mathbf{D_1}$ = dummy for resource industry, $\mathbf{D_2}$ = dummy for chemical/material industry, $\mathbf{D_3}$ = dummy for industrial sector, $\mathbf{D_4}$ = dummy for consumer discretionary/staples industry, $\mathbf{D_5}$ = dummy for information technology industry and $\mathbf{D_6}$ = dummy for utilities industry. The

telecommunication industry is captured in the intercept term. $\boldsymbol{\beta}_{\boldsymbol{i}}$ is the coefficient of the explanatory variables and $\boldsymbol{\varepsilon_i}$ is the error term of the model.[9]

The marginal probability analysis is based on the logistic binary regression model and it measures the likelihood of change in the probability (Δp) associated with underpricing (short-run market performance) due to a change in the explanatory variables. The marginal probabilities are very important for IPO investors for their investment decisions. Therefore, the marginal probability (Δp) was estimated by using the following probability equations:

$$P_i = \frac{e^{\propto + \sum_{i=1}^{n} \beta_i X_i}}{1 + e^{\propto + \sum_{i=1}^{n} \beta_i X_i}} \tag{11}$$

$$\Delta p = \beta_i P_i \, (1 - P_i) \tag{12}$$

Where $\boldsymbol{P_i}$ = the probability that underpricing (1) occurs in the short-run market; $\Delta \boldsymbol{p}$ = marginal probability, $\boldsymbol{\beta_i}$ = coefficient of each explanatory variable, $\boldsymbol{X_i}$ = the average value of each explanatory variable.

4. Results and Discussion

This section provides the statistical analysis and the results derived from the methodology discussed in Section 4.2. The discussion of the empirical findings on the short-run market performance of the first listing day returns and the post-day listing returns is presented in Section 5.1. The estimated models based on the short-run MRs are discussed in Section 5.2. The discussion on the marginal analysis is given in Section 5.3.

4.1 The short-run market performance

The short-run market performance was evaluated using the first trading day AARs and the post-day CARs. The findings of the first trading day AARs are discussed under the first-day primary market, the secondary market and the total market. The discussion is continued by industries, listing years and issue years under the primary, secondary and total markets. The first trading day returns and post-day returns are given in Tables 3 and 4, respectively.

[9]The logit and probit regression models are different due to the error term of each of the models. The cumulative distribution of the error term can be seen in a logit model and the normal distribution can be seen in a probit model (Kulendran & Wong 2001, p. 423). Further, these authors mentioned that the results of these binary models will not vary unless the sample size is large.

The first trading day returns of IPOs

Table 3 shows that the sample companies were underpriced in the primary market by 25.47% based on the AAR, which is statistically significant at the 1% level. In comparison with the primary MRs, Australian IPOs were overpriced in the secondary market by 1.55%, which is statistically significant at 5% level. The first-day total return indicated that all sample Australian IPOs were underpriced at 23.14% on the AAR, which is statistically significant at the 5% level.

Examining the IPOs by industries, in the primary market the highest level of underpricing was seen in industrial sector IPOs, at 68.03% based on abnormal returns. However, this underpricing level was not statistically significant. The resources sector IPOs were generally underpriced by 16.64%, which is statistically significant at the 1% level. The level of underpricing (23.88% on abnormal returns) in the telecommunications sector was also statistically significant at the 10% level. Information technology sector IPOs were also underpriced by 14.14% on abnormal returns. In contrast with IPOs in other sectors, the chemical and material sector IPOs were overpriced by 10.91% based on abnormal returns. It is interesting to see that IPOs in this sector earned negative returns in the first-day primary market. However, this negative return is not statistically significant. According to the closing price secondary market, the highest average overpricing level on abnormal returns was seen in the utility sector (7.54%) and the lowest was in the resources industry (0.70%). The average overpricing levels in the chemical and material sector was 6.35%. Overpricing (4.66% on abnormal returns) in the information technology industry was not statistically significant. In the secondary market, underpricing was not found in any sectors. Total MR analysis showed that the highest level of underpricing was seen in the industrial sector IPOs (65.31% based on abnormal returns). However, this underpricing level is not statistically significant. The resources sector IPOs were generally underpriced by 15.69%, which is statistically significant at the 1% level. The levels of underpricing (16.77% based on the abnormal return) in the telecommunication sector was also statistically significant at the 10% level. Chemical and material sector IPOs were overpriced by 15.94% based on the abnormal return, because the IPOs in this sector gave a negative return for their investors.

The listing year analysis shows that the highest level of underpricing took place in the primary market in the year 2008, at 106.37% based on abnormal returns. This level of returns is not statistically significant. In listing years 2006, 2007 and 2010, listed IPOs

were underpriced on abnormal returns by 17.62%, 16.38% and 14.02% respectively, and these were also statistically significant at the 1% level. The IPOs in listing year 2009 were underpriced by 9.1%, which is not statistically significant. Australian IPOs were overpriced in 2011 by 4.12% on abnormal returns. Statistical significance cannot be detected at this overpricing level. The listing year classification of the secondary market showed that IPOs were not underpriced based on abnormal returns in listing year 2008, which was not statistically significant. Statistically significant overpricing levels were found in 2007 and 2010 only. In 2007 and 2010 listed IPOs were overpriced by 1.90% and 2.99%, respectively. These rates of overpricing were statistically significant at the 10% and 5% levels. In the total market, the highest underpricing level was in 2008, at 101.26% of the abnormal return. However, this underpricing level was not statistically significant. In listing year 2011, overpricing was reported as 6.65%, which indicates negative returns for investors in that listing year. IPOs were underpriced by 16.85%, 13.83% and 10.60% in 2006, 2007 and 2010, respectively. These levels were also statistically significant at the 1% and 5% levels.

When we examined the IPOs in the primary market by the issue year, the highest underpricing level was seen in 2005 based on abnormal returns, which was not statistically significant. The lowest underpricing was seen in 2006, which was statistically significant at the 5% level. The IPOs issued in 2010 were underpriced by 11.15%, which is also statistically significant at the 1% level. In the issue years 2007 and 2009, IPOs were underpriced by 46.73% and 12.57% respectively, which was significant at the 10% and 5% levels. In the Australian IPO market, overpricing was not found in any issue years because negative returns were not reported in these periods. Statistically significant overpricing was found in the secondary market in issue years 2007 and 2010. In 2007 and 2010, issued IPOs were overpriced by 2.09% and 2.58% respectively, which is significant at the 5% level. The IPOs issued in all years were overpriced in the secondary market except in 2008. The first-day total MR analysis showed that the highest level of underpricing was seen in issue year 2005, at 56.06%. However, this was not statistically significant. Statistically significant underpricing levels were found only in issue years 2006, 2007 and 2010. In 2010, the IPOs issued were underpriced by 8.34%, which is statistically significant at the 1% level. IPOs issued in 2006 and 2007 were underpriced by 42.58% and 7.37%, respectively. These underpricing levels were statistically significant at

the 10% level. In comparison with the industry and listing year analysis, overpricing was not been found in the issue year analysis.

The post-day returns of IPOs

This section analyses the post-day returns by calculating the CAR for nine post-listing days. The calculated CARs of all sample IPOs for the nine post-listing days are shown in Figure 1.

Table 3
First trading day returns in the primary, secondary and total markets

Sample Classification	N	Primary Market		Secondary Market		Total Market	
		AAR (%)	t-stat	AAR (%)	t-stat	AAR (%)	t-stat
All sample companies	254	25.47	2.58***	-1.55	-2.29**	23.14	2.40**
By Industry							
Resources	143	16.64	4.26***	-0.71	-0.76	15.69	3.93***
Chemicals/Materials	4	-10.91	-0.64	-6.35	-2.08	-15.94	-0.96
Industrials	46	68.03	1.31	-1.15	-0.84	65.31	1.28
Consumer discretionary/Staples	31	18.29	1.40	-1.89	-0.97	13.71	1.42
Information technology	20	14.14	1.12	-4.66	-1.69	9.80	0.73
Telecommunications	4	23.88	2.38*	-4.56	-0.64	16.77	2.83*
Utilities	6	10.09	0.71	-7.54	-2.00	1.09	0.08
By Listing Year							
2006	68	17.62	2.58***	-0.60	-0.45	16.85	2.47**
2007	91	16.38	3.79***	-1.90	-1.83*	13.83	3.15***
2008	29	106.37	1.27	0.09	0.04	101.26	1.25
2009	17	9.10	1.35	-2.05	-0.50	9.18	0.91
2010	41	14.02	5.26***	-2.99	-2.06**	10.60	3.58***
2011	8	-4.12	-0.48	-3.28	-1.40	-6.65	-0.75
By Issue Year							
2005	9	62.45	1.43	-3.65	-0.59	56.06	1.34
2006	69	7.82	2.13**	-0.58	-0.49	7.37	1.79*
2007	96	46.73	1.84*	-2.09	-2.05**	42.58	1.72*
2008	19	9.42	0.90	0.88	0.23	10.90	0.93
2009	16	12.57	2.23**	-1.36	-0.45	12.20	1.45
2010	45	11.15	3.74***	-2.58	-1.99**	8.34	2.64***

N= Sample size, **AAR**= Market-adjusted average abnormal return
*Statistically significant at the 10% level, **statistically significant at the 5% level, ***statistically significant at the 1% level

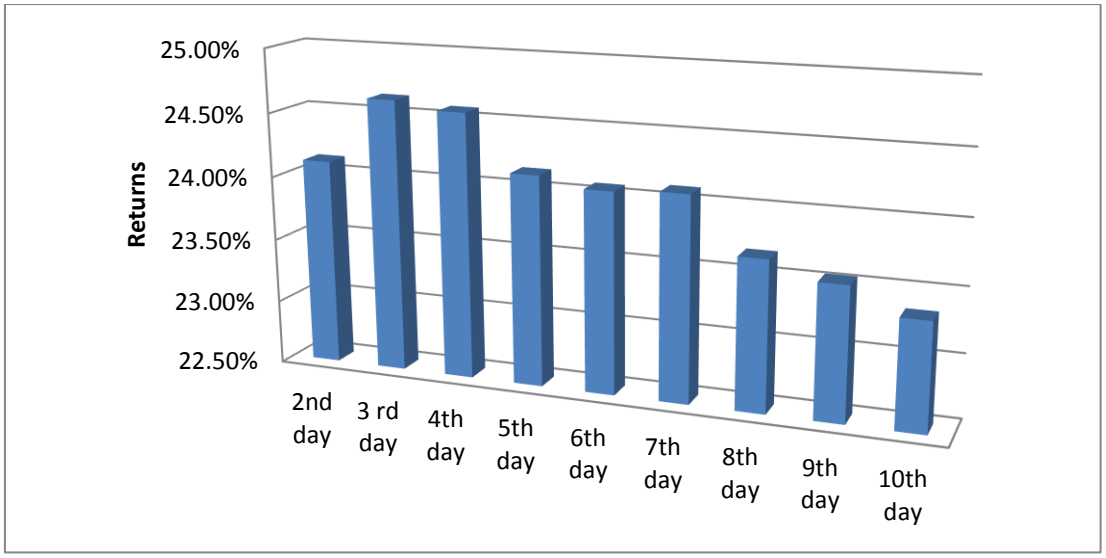

Figure 1
The calculated CARs for the nine post-listing days from 2006 to 2011

Table 4 provides the post-day listing returns for the third, sixth and tenth days by all sample companies, industries, listing years and issue years. All sample IPO companies were underpriced based on CARs, by 24.63%, 24.07% and 23.35% on the third, sixth and tenth days, respectively. However, only Day 6 was statistically significant, at the 10% level. The post-day listing returns of all IPOs decreased from the third day to the tenth day.

All IPOs in industries were underpriced, except in the chemical and material sector. Only IPOs in the industrial sector were statistically significant at the 1% level on all three post-listing days, and were underpriced by 68.94%, 67.84% and 66.30% on the third, sixth and tenth days, respectively. The chemical and material industry was overpriced on the third, sixth and tenth days by 16.03%, 18.41% and 23.34%, respectively. Only the return on Day 6 was statistically significant, at the 1% level.

The highest level of underpricing was found in listing year 2008, which was statistically significant at the 1% level. In 2008, the average levels of underpricing on the third, sixth and tenth days was 98.97%, 98.21% and 95.91%, respectively. The IPOs listed in 2011 were overpriced only on the third and sixth days, and were underpriced on the tenth day. However, these overpricing levels were not statistically significant.

The IPOs issued from 2005 to 2010 were underpriced on the third, sixth and tenth days, but this was statistically significant for all three days only for the IPOs issued in 2005. In 2007, the underpricing levels were statistically significant only on the third and sixth days. Overpricing was not found in these issue years.

Table 4
Post-day returns

Sample Classification	N	Day 3		Day 6		Day 10	
		CAR (%)	t-stat	CAR (%)	t-stat	CAR (%)	t-stat
All sample companies	254	24.63	1.50	24.07	1.75*	23.35	0.74
By Industries							
Resources	143	17.52	0.99	17.23	1.14	17.00	0.42
Chemicals/Materials	4	-16.03	-1.19	-18.41	-9.32***	-23.34	-1.18
Industrials	46	68.94	5.47***	67.84	6.54***	66.30	5.94***
Consumer discretionary/Staples	31	11.14	0.58	9.56	0.69	7.34	0.49
Information technology	20	9.98	1.39	9.83	0.79	10.13	0.90
Telecommunications	4	15.42	1.54	17.26	1.95	13.12	1.60
Utilities	6	6.34	0.26	6.82	0.87	10.01	0.62
By Listing Year							
2006	68	22.04	0.92	18.56	1.70*	19.21	1.03
2007	91	14.92	1.34	15.27	1.14	12.45	0.35
2008	29	98.97	4.68***	98.21	4.39***	95.91	3.78***
2009	17	7.57	0.74	9.41	0.72	10.40	0.89
2010	41	11.25	1.39	12.20	1.01	11.61	0.82
2011	8	-7.48	-0.95	-5.68	-0.72	6.99	0.07
By Issue Year							
2005	9	63.82	2.34**	58.68	4.78***	55.00	3.07***
2006	69	11.44	0.52	8.43	0.80	8.68	0.47
2007	96	42.96	2.84***	43.27	2.66***	41.00	1.15
2008	19	10.51	1.01	10.89	0.66	7.56	0.35
2009	16	11.85	1.27	13.06	1.00	12.53	1.26
2010	45	8.44	1.03	9.65	0.89	12.36	0.27

N= Sample size, CAR= Cumulative abnormal return
*Statistically significant at the 10% level, **statistically significant at the 5% level, ***statistically significant at the 1% level

4.2 The estimated models for the short-run market performance

This section estimates the binary regression statistical models with a view to identify the significant determinants of the short-run market performance. In Section 5.1, the short-run IPO market performance was identified as underpricing measured using short-run abnormal returns. The estimated binary regression models for the primary, secondary, total and post-day listing market are presented in Table 5. To eliminate multicollinearity, highly correlated variables were excluded from the estimated models. Only the statistically significant explanatory variables are reported in these estimated models, which indicate only the issue and market characteristics as short-run determinants. The firm characteristics were not statistically significant in these estimated models. Some of the industries represented by dummy variables were also significant in the estimated regression models. The logit statistics of the estimated models in Table 5 are significant at the 5% level, indicating that the models are valid. The significant determinants of short-run underpricing in the estimated models are discussed below.

Underpricing (short-run market performance) and LISD

The estimated regression models in Table 5 showed that LISD was negatively and significantly associated with the level of underpricing, and was statistically significant at the 1% level for all estimated binary models except the secondary market. The results showed that lower LISD IPOs were more underpriced compared to the higher LISD IPOs. This suggests that increasing LISD will lead to a decrease in demand from informed investors because informed investors may not consider the issue an attractive investment and withdraw from the market. In other words, this may give an opportunity to uninformed investors to invest in the issue. This situation may lead to minimising the winner's curse problem, and significant underpricing is not necessary to attract uninformed investors. Therefore, according to Rock's hypothesis, we cannot expect a higher level of underpricing with longer delays in listing. This finding is consistent with previous studies of Australian IPO performance (How 2000; Lee, Taylor & Walter 1996). These authors found that LISD is an important variable of underpricing in Australian IPOs and can be used to test Rock's hypothesis. According to the uncertainty hypothesis, however, Chowdhry and Sherman (1996) found that a longer listing time indicates more uncertainty about the offer. Mok and Hui (1998), Su and Fleischer (1999), Megginson and Tian (2006) and Salama Zouari et al. (2011) also found a positive association between the level of underpricing and LISD.

Underpricing (short-run market performance) and IPOP

The primary market, total market and post-day market binary regression models showed that the IPOP coefficient was negative and statistically significant at the level of 1% in the primary and total markets, and 5% in the post-day market. This shows that if the IPOP is increased it leads to decreased levels of underpricing, suggesting that the level of underpricing can be reduced due to uninformed investors (Rock 1986). If the IPOP is increased it may offer a greater opportunity for uninformed investors to invest in the offer. Therefore, future demand may decline due to fewer numbers of uninformed investors in the market, and a relatively high level of underpricing cannot be used to attract or compensate uninformed investors who suffer from the winner's curse. Therefore, according to Rock's hypothesis a lower level of underpricing can be expected with longer IPOP.

Underpricing (short-run market performance) and TOTP

The estimated secondary market models showed that there was an inverse relationship between underpricing and TOTP. This implies that IPOs with higher TOTP tend to have lower levels of underpricing. Rock (1986) found that underpricing can be used to attract uninformed investors who exist due to the winner's curse problem. This problem indicates that informed investors do not offer opportunities for uninformed investors to invest when the offer is attractive, and they withdraw from the market when the offer is unattractive. Lee, Taylor and Walter (1996) also found that quickly sold issues (longer issues) are more underpriced (less underpriced) due to the higher (lower) level of informed demand. How (2000) found that there is a statistically significant negative relationship between underpricing and TOTP. This finding is statistically significant at the 1% level and consistent with Rock's hypothesis.

Underpricing (short-run market performance) and TNPR

Table 5 shows that there is an inverse association between underpricing and the TNPR of the issuing company. This finding implies that the higher the TNPR of an IPO firm, the lower the level of underpricing based on the estimated binary models, except in the secondary market model. It could be argued that there is a lower risk for the IPOs with greater TNPR, which results in lower underpricing. If TNPR increases, future investors consider this offer as a lower-risk investment. They cannot earn higher return on this investment because it is considered as low-risk. Therefore, lower prices can be expected due to the lower risk. As a result of the lower prices, higher levels of underpricing can be seen in the short-run IPO market. Dimovski and Brooks (2004) have also reported a negative association between retained capital and the level of underpricing. Retained capital is a similar variable to the TNPR, which shows the percentage of equity capital retained by an IPO company after paying the issue costs. Therefore, our result is consistent with the uncertainty hypothesis, and is statistically significant at the 1% level for the estimated total and post-day market models and the 5% level for the primary market.

Underpricing (short-run market performance) and MV

According to the estimated binary primary market model given in Table 5, the MV (MV_{t-60}) appears to be positively related to underpricing, indicating that IPO firms with higher MV tend to show higher underpricing in the primary market. In other words, the smaller the MV of the firm, the lower risk the firm, and the lower the level of underpricing will be.

This relationship is also consistent with the uncertainty hypothesis, which in turn also supports the normal hypothesis of a risk-return relationship. This result is also statistically significant at the 10% level.

Note-Table 5: Figures in brackets indicate the significance levels. A negative sign indicates an inverse relationship between explanatory variables and the dependent variable, whereas a positive sign shows a direct relationship. **N** = sample size, **TOTP** = total listing period in days, **IPOP** = IPO period in days, **LISD** = listing delay in days, **TNPR** = total net proceeds ratio, $\mathbf{MV_{t-60}}$ = MV of 60 days period prior to closing date of the offer, $\mathbf{D_1}$**=** dummy for resource industry, $\mathbf{D_3}$= dummy for industrial sector, $\mathbf{D_4}$= dummy for consumer discretionary/staples industry, $\mathbf{D_5}$ = dummy for information technology industry, $\mathbf{D_7}$ **=** dummy for utilities industry. **LR** statistics test the joint hypothesis that all slope coefficients except the constant are zero. **Probability** is the p value of the LR test statistics. $\mathbf{R^2}$ is the McFadden R-squared. *Statistically significant at the 10% level, **statistically significant at the 5% level, ***statistically significant at the 1% level.

Table 5
Estimated binary (logit and probit) regression models for the short-run market performance

Short-Run Market Performance	Estimated Logit Model from January 2006 to January 2011	N	LR statistics	Probability (LR stat.)	R^2%
Primary market	$ln\left[\frac{P_i}{1-P_i}\right]$= 8.591 - 0.034 **IPOP**– 0.030 **LISD** – 8.073 **TNPR** + 76.348 **MV$_{t-60}$** (0.005)*** (0.001)*** (0.028)** (0.100)*	254	28.60551	0.000009	28.9
Secondary market	$ln\left[\frac{P_i}{1-P_i}\right]$= 0.334 - 0.017 **TOTP** (0.016)**	254	6.925333	0.008498	10.2
Total market	$ln\left[\frac{P_i}{1-P_i}\right]$= 10.090 - 0.033 **IPOP** - 0.038 **LISD** - 9.173 **TNPR** (0.006)*** (0.000)*** (0.012)***	254	35.42371	0.000000	22.5
Post-day market	$ln\left[\frac{P_i}{1-P_i}\right]$= 8.828 - 0.028 **IPOP** - 0.028 **LISD** - 10.481 **TNPR** + 2.216 **D$_1$** + 2.650 **D$_3$** + 1.858 **D$_4$** + 2.223 **D$_5$** + 2.173 **D$_7$** (0.016)** (0.001)*** (0.005)*** (0.013)** (0.005)*** (0.052)* (0.028)** (0.081)*	254	35.00782	0.000027	25.3
	Estimated Probit Model from January 2006 to January 2011				
Primary market	P_i= 5.020 - 0.021 **IPOP**– 0.018 **LISD** – 4.665 **TNPR** + 44.276 **MV$_{t-60}$** (0.005)*** (0.000)*** (0.029)** (0.102)*	254	28.51855	0.000010	28.8
Secondary market	P_i= 0.205 - 0.010 **TOTP** (0.013)***	254	7.034133	0.007997	10.1
Total market	P_i= 5.874 - 0.019 **IPOP** - 0.022 **LISD** - 5.301 **TNPR** (0.006)*** (0.000)*** (0.013)***	254	35.05781	0.000000	22.4
Post-day market	P_i= 5.318 - 0.017 **IPOP** - 0.017 **LISD** - 6.324 **TNPR** + 1.359 **D$_1$** + 1.619 **D$_3$** + 1.133 **D$_4$** + 1.341 **D$_5$** + 1.319 **D$_7$** (0.014)*** (0.001)*** (0.012)*** (0.009)*** (0.003)*** (0.043)** (0.024)** (0.077)*	254	35.15332	0.000025	25.2

4.3 Marginal probability analysis of the short-run market performance

This section analyses the marginal probability associated with the significant variables in the short-run IPO market in Australia based on the estimated models in Table 5. Marginal analysis was used to determine the most important explanatory variables that contributed to change in short-run market performance. The calculated marginal probability associated with the variables in the short-run market (based on the first-day returns), such as the primary, secondary and total markets, are presented in Table 6 and the post-day market (based on the post-listing returns) in Table 7.

Table 6
The change in probability (Δp) due to a change in explanatory variables

Variables	Primary Market Δp	Secondary Market Δp	Total Market Δp
TOTP		-0.041×10^{-3}	
IPOP	-0.071×10^{-3}		-0.076×10^{-3}
LISD	-0.063×10^{-3}		-0.080×10^{-3}
TNPR	-0.169×10^{-1}		-0.212×10^{-1}
MV_{t-60}	0.160×10^{0}		

Note: A negative sign indicates an inverse relationship between the explanatory variables and underpricing, whereas a positive sign shows a direct relationship. **Δp** = marginal probability, **TOTP** = total listing period in days, **IPOP** = IPO period in days, **LISD** = listing delay in days, **TNPR** = total net proceeds ratio and $\mathbf{MV_{t-60}}$ = MV of the 60-day period prior to the closing date of the offer.

Table 6 shows the calculated marginal probabilities for the significant explanatory variables in the primary, secondary and total markets. Except for MV_{t-60}, all other explanatory variables in these market models had a negative sign. The negative sign for IPOP shows that if the IPOP is increased by one day then the probability of a change to overpricing or a decrease in the level of underpricing is 0.071×10^{-3} for the primary market and -0.076×10^{-3} for the total market.The positive sign for MV_{t-60} in the primary market indicates that if the MV increases by one unit then the probability of change to underpricing or a decrease in the level of overpricing is 0.160×10^{0}. The negative sign for LISD indicates that if listing is delayed by one day then the probabilities of change to overpricing or decrease in the level of underpricing are 0.063×10^{-3} and -0.080×10^{-3} for the primary market and the total market, respectively. A one unit increase in TNPR will result in a decrease in the probability of occurrence of underpricing by -0.169×10^{-1} and -0.212×10^{-1} for the primary and total markets, respectively. The MV_{t-60} and TNPR are the most important explanatory variables in the primary and total market models. Only one explanatory variable was significant under the secondary market model; the total period (TOTP). The negative sign for TOTP indicates that a one-day increase in the total period

will result in a decrease in the probability of the level of underpricing or an increase in the probability of overpricing by 0.041 $x10^{-3}$.

Table 7
The change in probability (Δp) due to a change in explanatory variables

Industry Dummy	IPOP Δp	LISD Δp	TNPR Δp
D_1	-0.065×10^{-3}	-0.065×10^{-3}	-0.241×10^{-1}
D_3	-0.055×10^{-3}	-0.055×10^{-3}	-0.206×10^{-1}
D_4	-0.069×10^{-3}	-0.069×10^{-3}	-0.259×10^{-1}
D_5	-0.065×10^{-3}	-0.065×10^{-3}	-0.241×10^{-1}
D_7	-0.065×10^{-3}	-0.065×10^{-3}	-0.244×10^{-1}
Average Marginal Prob.	-0.064×10^{-3}	-0.064×10^{-3}	-0.238×10^{-1}

Note: A negative sign indicates an inverse relationship between explanatory variables and underpricing, whereas a positive sign shows a direct relationship. Δ**p** = marginal probability, **IPOP** = IPO period in days, **LISD** = listing delay in days, **TNPR** = total net proceeds ratio, $\mathbf{D_1}$ **=** dummy for resource industry, $\mathbf{D_3}$ = dummy for industrial sector, $\mathbf{D_4}$ = dummy for consumer discretionary/staples industry, $\mathbf{D_5}$ = dummy for information technology industry, and $\mathbf{D_7}$ **=** dummy for utilities industry.

Table 7 shows the calculated marginal probabilities associated with the significant variables in the post-day market based on the industry dummies. Table 5 shows that some industry dummies were statistically significant on the return in the post-listing day market. The post-day market model also showed an inverse sign for the explanatory variables.

The resources industry and the information technology industry dummies showed similar marginal probabilities for the significant explanatory variables, whereas the other industry dummies indicated different marginal probabilities in relation to each significant variable. The highest marginal probability of all the explanatory variables was found in the consumer discretionary sector, whereas the lowest probabilities were found in the industrial sector. However, there was not much difference between the probabilities of the explanatory variables in the different industries. Therefore, the average marginal probability was also estimated for each of the explanatory variables. According to the average marginal probability, TNPR is the most important variable of the post-day market as it showed the highest marginal probability compared to the others. The negative sign for TNPR indicates that if TNPR is increased by one unit then the probability of change to overpricing or a decrease in the level of underpricing is 0.238 $x10^{-1}$.

5. Conclusion

This research paper has evaluated the short-run market performance of the Australian IPOs listed from 2006 to 2011 using the first listing day returns and the post-day listing returns. The first listing day returns were analysed by considering the first listing day primary market, the secondary market, and the total market using the AARs. The post-listing returns were analysed using the CARs. This study identified the issue, firm and market characteristics that act as determinants of short-run underpricing with the aid of binary regression models. A marginal probability analysis was also carried out to measure the risk associated with the determinants of short-run underpricing.

The analysis based on the PRIMs, total MRs and the post-day listing returns shows that Australian IPOs are underpriced in the short-run. This finding is in agreement with the underpricing phenomenon associated with IPOs, which is widely accepted as universal. Although the Australian IPOs are underpriced, the post-day listing return indicates that the level of underpricing slowly decreases after listing, particularly from the seventh day to the tenth day, due to the decrease in post-listing prices. A decreasing trend for post-listing returns is in line with the findings of Aktas, Karan and Aydogan(2003), Kenourgios, Papathanasious and Melas (2007) and Kazantzis and Thomas (1996). However, Sohail, Raheman and Durrani (2010) argue that this trend can be expected only up to the tenth day under normal economic conditions. A decreasing trend for post-listing returns signals that investors' wealth can be diluted due to overpricing in the long run. However, this finding is in contrast with the finding of Finn and Higham (1988), who found that the level of underpricing is steady after Day 6.

The SECON analysis indicated that Australian IPOs are overpriced by 1.55% on abnormal returns. This result is consistent with studies by Barry and Jennings (1993) and Benveniste and Spindt (1989). Barry and Jennings (1993) found that 90% of the initial day's returns came though the opening transaction, suggesting that initial IPO subscribers who take shares at the offer price are the sole beneficiaries of underpricing. In contrast with this finding, Chang et al.(2008), Bradley et al. (2009), Aggarwal and Conroy (2000), and Schultz and Zaman (1994) documented that IPOs were underpriced in the first-day secondary market[10].

[10]We have not compared our findings directly with previous research findings on Australian IPOs because we are unaware of any study that has focused on the first-day primary and the secondary market in Australia.

Analysis of short-run IPO market performance by industries, listing years and issue years shows that there is substantial variation in the level of short-run performance. The determinants of underpricing in Australia IPOs are the IPOP, TOTP, LISD, TNPR and the MV. These determinants confirm that the issue and market characteristics are more important than the firm characteristics when explaining short-run underpricing in Australian IPOs. The IPOP, TOTP and LISD support Rock's hypothesis, while the TNPR and MV confirm the uncertainty hypothesis. The marginal probability showed that increasing (decreasing) MV and decreasing (increasing) TNPR leads to an increase in (decreasing) the level of uncertainty, which causes an increase (decrease) in the level of underpricing in the short run.

6. References

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